



Bending the Spend:

Expanding access to hearing technology to improve health, wellbeing and save public money

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The report is the work of the authors.



The Ear Foundation®



The Impact of Hearing Loss

- ▶ One in three adults over 65 will have hearing loss (WHO 2013)
- ▶ By 2031, it is estimated that 14.5 million people in the UK, approximately 20% of the population, will have hearing loss. (Action on Hearing Loss 2011)
- ▶ At least 1 in 10 adults aged 40 to 69 will have a substantial hearing loss. (Dawes 2014)
- ▶ Adult onset hearing loss is among the top ten disabilities in terms of years lived with disability (YLD) for those over 60 years in England and as life expectancy increases, YLD from hearing loss will increase. (Murry 2015)
- ▶ The World Health Organisation estimates that in the UK adult onset hearing loss will be in the top ten disease burdens, above diabetes and cataracts by 2030. (Mather 2006)
- ▶ Unemployment rates for people with hearing loss are much higher compared to the national average with 30% of people of working age with severe hearing loss unemployed. (Action on Hearing Loss 2013)
- ▶ Recent estimates suggest that the UK economy loses £25 billion a year in productivity and unemployment through hearing loss. (International Longevity Centre 2015)
- ▶ In older age people with hearing loss are at greater risk of social isolation and reduced mental well-being. (Shield 2006).
- ▶ Social isolation has an effect on health (Cohen 1997) and in older people there is a strong correlation between hearing loss and cognitive decline (Lin 2013), mental illness and dementia (Lin 2011) and premature death. (Friburg 2014, Contrera 2015).
- ▶ Each 10 dB worsening of hearing loss is associated with an increased likelihood that a person will report a fall over the preceding 12 months by 40%. (Lin 2012)
- ▶ Those with severe hearing loss are at five times the risk of developing dementia as those with normal hearing. (Lin 2013)

The report recommends:

- 1 As part of the implementation of the Action Plan on Hearing Loss, NHS England should ensure there is a review of the current specialist commissioning criteria for cochlear implants working in collaboration under the principles of co-production with the users.
- 2 In line with the aspirations of the Action Plan on Hearing Loss (England) commissioners of health care should look at more innovative models of funding and service delivery including opportunities created by telemedicine, service innovation and new delivery models.
- 3 The National Institute of Health and Clinical Excellence should review its current guidance on cochlear implants for both unilateral and bilateral implantation to take account of real world benefits and additional costs of hearing loss.
- 4 The National Health Service (NHS), working with the audiology, medical professions and users should develop a targeted programme to promote greater awareness of the benefits of cochlear implants for GPs and other health professionals including the importance of early intervention and integrated planned support as part of the Action Plan in England.
- 5 Professionals in Audiology and related services have the training and support to ensure that they can properly identify and refer those who could benefit from cochlear implantation.
- 6 Health care providers ensure that those with hearing loss have their needs assessed and are supported to effectively self-manage any other long term conditions they may have.

SECTION 1:

Introduction

Losing the ability to communicate through hearing loss is one of the least recognised public health issues of our time yet one which has huge impact.

For some it can literally be a silent killer (Friburg 2014). In our previous reports (Lamb 2013 and Archbold 2014) we demonstrated that hearing loss has a dramatic impact on the quality of life of those affected. We also showed that not addressing hearing loss early dramatically increases the economic burden to society through the additional costs for health services, loss of independence and additional care costs in treating the consequences of hearing loss. In our report (Archbold 2014), we conservatively estimated the costs to be in the region of £30 billion per year for loss of quality of life, additional use of GP services and lost income. We argued for a radical shift in the availability of cochlear implants and other hearing technologies, both for the benefit of the individual and to ensure the best use of scarce health care resources. Ensuring early intervention and support for those with hearing loss will secure a more healthy population with a better quality of life who are less reliant on public services in the future. The key question for policy makers should be not can we afford to address hearing loss, but can we afford NOT to?

Intervening early and managing the long-term condition of hearing loss by ensuring the availability of the most up to date hearing technologies is essential to tackling this major public health issue. Only 2 million people out of the 6 million in the UK who could benefit from hearing aids are using them to address their hearing loss. (Action on Hearing Loss 2011) Evidence also suggests that only one in twenty people who could benefit from cochlear implants are able to access the technology in the UK (Raine 2013), with similar rates of underutilisation found in the United States (Choi 2014).

To address this issue we need to Bend the Spend: moving resources from one area to another without major disruption so we can ensure improved services for those with hearing loss. As we intervene earlier we can make considered change to support moving resources from areas of lesser effectiveness to areas of maximum effect, as savings are made. In times of austerity we need a new approach to ensure that we can meet the needs of the growing population of adults with hearing loss.

"Before implantation I had the strongest bilateral behind the ear hearing aids and wasn't coping very well; I was becoming more withdrawn and depressed. It took me a long time to pluck up the courage and go for the implant mainly because of the bad press from others; for instance the sound will be just like Mickey Mouse and Donald Duck, and it was just that when I was first connected but only for a few minutes and then it was magic, coming back home after my wife was driving and kept saying what is that sound it was rain on the roof and also many other sounds, the car indicators bleeping the engine running, the cooling fan running; it was magic and the magic is still there."

Cochlear implant user



One of the key objectives of health policy is:

"To ensure that all people with hearing loss are diagnosed early (with a particular focus on early identification of hearing loss in disadvantaged groups and groups with higher risks and prevalence), and that they are managed effectively once diagnosed."

(NHS 2015 p20)



This Report: Bending the Spend

This report considers the economic impact of hearing loss, but also explores further the economic benefits of hearing technologies, both from a health economics perspective and also from the perspective of users.

It goes on to consider how we can change how we deliver services and more innovative ways of working by Bending the Spend.

- Our new evidence from cochlear implant users illustrates that tackling hearing loss increases independence, reduces the demand for other services, supports increased capacity for people to maintain their own and others' independence and makes it easier for them to obtain or sustain employment.
- We have also taken our economic analysis further by looking over time at the possible impact of the introduction of cochlear implants and digital hearing aids on the costs of hearing loss to society in the context of the broader societal changes which may have impacted on their effectiveness.

As we argued in our previous reports we need:

- a national screening programme for adult hearing loss to ensure early intervention
- a review of the guidelines for adult cochlear implantation taking into account real-life measures
- greater awareness in the medical profession of the impact of hearing loss and the potential of today's technologies.

This can only happen within the context of an overall strategy for hearing loss.

The Action Plan on Hearing Loss: A Strategy for England

In our previous reports, we urged the Government to bring forward the Action Plan on Hearing Loss for England, to ensure that there is an overall strategic approach. The Action Plan (NHS/DoH 2015) has now been published and is extremely helpful in setting out a clear picture of the challenge faced by our health care system and other public services if the cost of addressing hearing loss is not tackled.¹ It could also provide a model for other health care systems. The Plan describes the challenge of tackling hearing loss as a *"major public health issue"*, particularly in relation to the growing numbers of older people with hearing loss, for whom hearing loss has a *"disproportionate effect on their wider physical and mental health, independence and ability to work"*. Hearing loss is *"responsible for an enormous personal, social and economic impact throughout life."*

Further it recognises that:

"Overall, the personal, societal and economic costs of hearing loss will continue to rise as the incidence and prevalence of hearing loss increases with an ageing population" (NHS/DoH 2015 p10)

The fundamental role of early intervention in addressing the consequences of the long term health effects of hearing loss is also acknowledged in the Plan:

"Early identification and intervention are key actions that should make a real difference in reducing risks and attaining better hearing health outcomes throughout life. It is particularly important in reducing the impact and cost of congenital hearing loss and of long term conditions such as adult onset progressive hearing loss." (Action Plan 2015 p19).

The aspirations of the Action Plan are excellent but its implementation will take place in health care debates world-wide which focus on how much services cost. We need to change the conversation from one in which only the costs of providing hearing technology are assessed to one in which the greater costs of not addressing hearing loss become the focus of health policy.

¹ The Government of Northern Ireland has also produced a similar strategy, the Physical and Sensory Disability Strategy and Action Plan 2012-2015. In the United States there are similar discussions about access to Medicare through new commissioning arrangements to wider access.

Only by investing in early intervention and the best use of technologies will we actually ensure that some of the massive challenges facing Government funding as a consequence of an ageing population will be tackled. We need not only to sustain current provision but also to invest further in additional provision if we are to mitigate some of the future rising costs we face.

This will become especially important as our society ages: people increasingly expect to live longer, work longer and to maintain a better level of health. Being able to communicate independently is crucial to being able to do so. By investing in better hearing health now, we will be able to support a healthy population which can work longer, stay well longer into older age and remain active and independent. If this can be achieved real costs to society will be reduced.

With the clear framework established by the Action Plan we still need a better commissioning and funding framework in England and elsewhere, to ensure that decisions take account of the real costs of hearing loss and ensure early intervention to prevent the damaging consequences of hearing loss. As part of the new commissioning strategy proposed by the Action Plan we also need to have a fresh look at the specialist commissioning framework and the eligibility criteria for cochlear implants and other new technologies. (Lamb 2013, Archbold 2014)

The Action Plan also clearly recognises that older people want and need better support and are willing to embrace this new technology.

As the Action Plan notes, older people want:

- Clarity about their diagnosis and cause of hearing loss accompanied by clear, realistic information about hearing loss and how to use their hearing instruments;
- Early and timely access to the latest technology such as cochlear implants and assistive devices for those who require them;
- More support after being provided with hearing aids (Action Plan 2015)

Further the Action Plan is clear that integrated services offer a better prospect of ensuring the wider ranging issues posed by hearing loss are better addressed.

These issues include:

- “Improved access to a choice of support to manage hearing loss, including innovative technologies (e.g. hearing aids and implants) assistive devices which integrate with hearing aids, and support from tele-audiology.” *and*
- “Equitable access to innovative technologies including support by mobile or tele-healthcare for any long term conditions.” (Action Plan 2015 p24)

As the Action Plan recognises, hearing loss is a long term condition and it is important not just to introduce new technology but also to ensure that people are supported to use it over the longer term so we can realise the health benefits and savings.

Funding Challenges

World-wide the context for funding health innovation is becoming more difficult. The context for implementing the Action Plan in England is especially challenging against a background of a funding crisis in the NHS. The consequences of financial tightening should be to drive more rational decision making with the aim of preventing future costs escalating by investing in improving health now. This is a key part of the strategy in the NHS five year plan. (NHS 2015)

However the current reality is that funding bodies (in England these are Clinical Commissioning Groups [CCGs]) are cutting the very provision they should be expanding. For example in a recent survey of 108 CCGs in England, 39 had cut their budgets for audiology services this year with some refusing hearing aids to those with mild/moderate hearing loss. Many audiology services have also seen cuts as demonstrated in the national survey carried out by Action on Hearing Loss (Carlton 2015). This will reverse the huge progress which audiology services have made in addressing hearing loss with the newer technologies and will only increase costs longer term across the whole health and social care system.

A key issue faced in all health systems will be tackling the perverse incentives created by artificial budget compartments which take no account of the overall impact to public service expenditure. Current constraints mean that often one particular budget cannot benefit from savings accrued elsewhere. A strategic approach to budgeting would Bend the Spend: providing more for prevention, for the provision of cochlear implants and for hearing aids, yielding savings in dealing with the social costs and avoidable consequences of hearing loss. We also need to ensure that the right support mechanisms are in place longer term to support people in using the technology to achieve the greatest possible benefit through good aftercare, peer support and maintenance.

While we need a national strategy in England, this is an issue which should be addressed in other countries. Increasing access to those who can benefit from hearing technologies and using more innovative and cost effective models of service delivery.

This report aims to contribute to that debate by providing the patient view, demonstrating the savings which can be made from early intervention and showing that more innovative service provision can support expanding access to interventions and follow up support.

SUMMARY POINTS:

Hearing Loss is a major unaddressed public health issue which leads to substantial costs to public services and the individual.

We need to move from calculating the cost of addressing the public health consequences of hearing loss towards calculating the cost of not addressing hearing loss. We need to recognise that there will be a rising tide of costs to public services through poor health and greater dependency if we don't act now.

The development of a public health strategy such as the Action Plan on Hearing Loss provides a new opportunity to radically change the focus of public health services.

SECTION 2:

An era of change: the rapid development in hearing technologies: 1990's onwards

Cochlear Implants

A cochlear implant is made up of parts that are worn outside the body (microphone, sound processor and transmitter coil) and parts that are placed under the skin behind the ear (receiver-stimulator) and in the inner ear (electrodes) during an operation. The microphone is often worn behind the ear like a hearing aid. It picks up sounds which are turned into electrical signals by the receiver-stimulator and sent to the brain by the electrodes placed in the inner ear (cochlea). Sounds heard with a cochlear implant are not the same as those heard with the human ear. With an appropriately programmed system and support, the person with a cochlear implant becomes able to use their implant to understand speech and other sounds.



Cochlear implantation provision

Cochlear implantation, providing useful hearing for those too deaf to benefit from hearing aids, first became available for adults in the 1980s with work initially in developing devices in France, Belgium, Austria, USA and Australia; for overview see Archbold, 2010. Initial guidelines were conservative, with adults who had been deafened and had no residual hearing being considered candidates. In the UK the initiative by the Department of Health to pilot cochlear implantation resulted in a report in support of cochlear implantation (Summerfield and Marshall, 1995) and with a growth of implanting centres. These centres grew to be highly specialist with large multi-professional teams (Archbold, 2010) and there was a resultant steady growth in implantation.

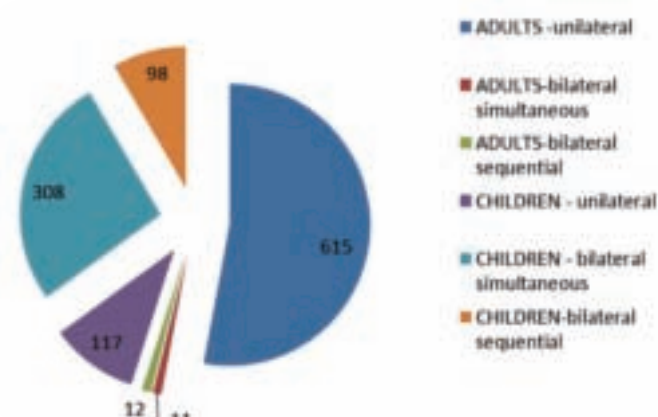
As cochlear implant technology has developed so has its effectiveness. For example, Dowell (2012) reviewed the evidence supporting the effectiveness of cochlear implants in adults across the past several decades and found that average open-set sentence identification averaged less than 40% for sound processors in the 1990s as compared to on average 80% correct scores with modern technology, even without visual cues.

This is an indication of the extent to which functional performance in real life situations has changed as the technology has improved.

The British Cochlear Implant Group (BCIG) was established to bring together the implanting centres in the UK and to support the development of national guidelines and criteria. This was very useful when National Institute of Health and Clinical Excellence (NICE) reviewed cochlear implantation, resulting in the support of implantation in both adults and children in 2009. These initiatives in the UK resulted in a steady growth of cochlear implantation in the 1990's and 2000's.

The figures from BCIG are as follows:

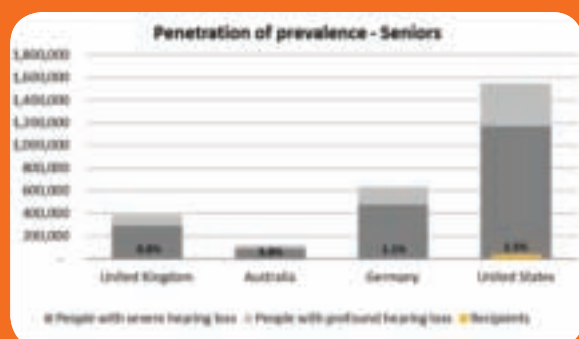
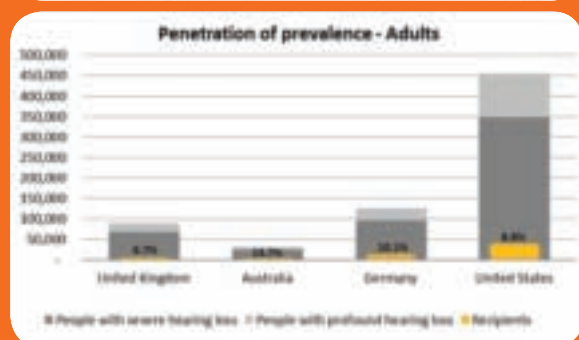
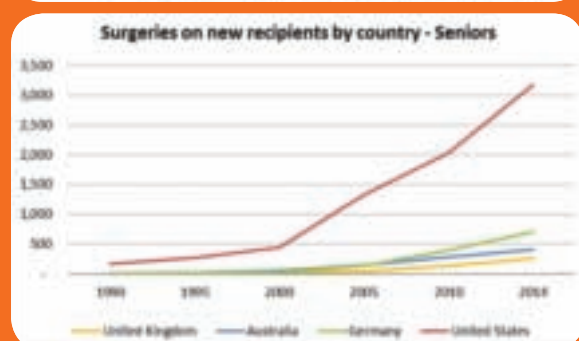
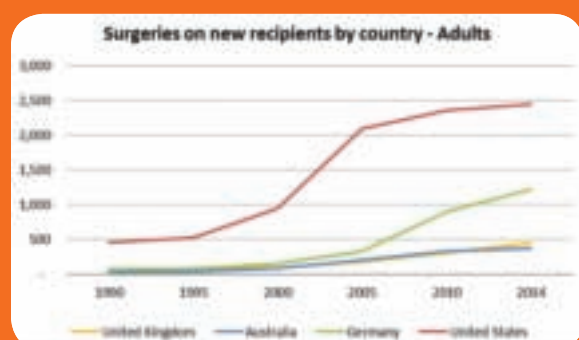
New Cochlear Implant cases in the UK
April 2013 – March 2014



The figures below show the estimated increase in implantation for adults and for seniors (over 70); they show that the UK lags behind other countries (estimated figures provided by Cochlear).

The figures also show the penetration rates: numbers implanted compared with those estimated to have a degree of hearing loss that would make implantation appropriate.

² Looking the figures in relation to estimated prevalence we can see that the UK has fallen behind in respect of volume of new surgeries especially in relation to seniors and the percentage of those fitted relative to those who could be eligible.



² Prevalence rates taken from: Stevens, GA, S. Flaxman, E Brunskill, M Mascarenhas et al. 2011. Global and regional hearing impairment prevalence: an analysis of 42 studies in 29 countries. The European Journal of Public Health. doi: 10.1093/eurpub/ckr176. Rates of penetration here are slightly higher than those used at other points in this report due to differences in assumptions about eligibility.

Innovation in hearing aid provision

Hearing aid ownership among 41 to 70 year-olds in the early 1980s was estimated at 2.8% in the UK (Davis 1995). This represented a significant underutilization as 9.4% of 41 to 70 year-olds had a hearing loss severe enough to benefit from a hearing aid, and there was poor usage due to hearing aids providing poor quality of sound and other social factors such as stigma and lack of follow on support.

A significant change in the technology took place in late 1990s with the advent of digital hearing aids. These had the advantage of being programmable to the user's hearing profile and they could also provide better utility through enhancing the perception of speech in noise. Digital hearing aids became routinely available on the NHS in England through the Modernising Hearing Aid Services (MHAS) Programme from 2000-2005 as the service was transformed. (Lamb 2009) The new technology delivered a 41% gain in patient benefit. (Davies 2002) We can also confidently assume significant gains in terms of the impact of this technology in reducing the call on other services as a result of these changes.

It is striking that despite significant advances in hearing aid technology and improvements in provision by the National Health Service, hearing aids remain significantly underutilized despite massive improvement in the technology due to a combination of poor awareness of the consequences of hearing loss, stigma and lack of national screening programme. (Davies 2007, Action on Hearing Loss 2011, Ramdoo 2014). The challenge is how to ensure that even greater benefits for individuals and society can be gained by supporting greater use of the technology.

We urgently need to address this.

SECTION 3:

The developing evidence

Evidence continues to grow since our previous reports about the effectiveness of today's hearing technologies for adults, including the elderly, particularly with regard to cochlear implantation.

Employment

People with hearing loss are less likely to be employed compared with people without hearing loss. (ONS 2015) In our previous reports we referred to the growing evidence of the economic impact on the individual of hearing loss and the capacity of technology to mitigate that impact. For example we reported that people with hearing loss who did use hearing aids had employment rates which were almost double those who did not (Kochin 2010); while in Canada patients who had been fitted with a cochlear implant had an increase in median yearly income compared with pre implantation of over \$12,000. (Monterio et al 2012)

Clinkard et al (2015) has recently measured the effect on personal income in people who receive a cochlear implant by looking at a number of people who had been implanted, on average, around six years previously.

Clinkard found that 31% of respondents had increased income enough to move income brackets, with a mean category rise of \$10,021 and concluded that

"Increased accesses to cochlear implantation may provide opportunities for competitive employment and associated economic benefits for the individual, their families, and society."

The research also found that, while 60% of patients at the time of initial cochlear implantation were unemployed, after cochlear implantation the unemployment rate was reduced to 49%.

A further 25% of the patients (who had been employed at the time of implantation) reported improved employment status after cochlear implantation such as promotion, a new job or a salary increase.

From indirect data they also found that patients on average had an annual income increase of \$12,000 per annum post cochlear implantation. This substantial increase in personal annual income allows a substantial portion of the direct costs of cochlear implantation to be recoverable via increased future individual income and tax revenue. They also concluded that in some patients cochlear implantation may potentially be cost-saving over the expected lifespan of their implant and deliver wider cost savings to public services.

Cost effectiveness of cochlear implantation

The impact of cochlear implants on quality of life has already been extensively evidenced and Penaranda (2015) found that in a cost utility study comparing those with cochlear implants and a control group who used hearing aids to treat profound sensorineural hearing loss there was an economic cost differential to the advantage of cochlear implants of \$204,000 over the expected lifetime of the patients analysed. This was due to the greater level of expenses hearing aid users would have over those with the implant. The cochlear implant delivered a return on investment of \$2.07 for each dollar invested. It also produced positive cost utility in gain in decibels and cost effectiveness in gain in language discrimination.

Cochlear implantation and quality of life

The impact of cochlear implantation on quality of life is well established (Lamb 2013, Archbold 2014, Action Plan 2015). Research continues to refine our understanding of the potential impact of cochlear implants since our previous reports including data on two implants for adults, rather than one.

Jeffs (2015) provided further support for the idea that cochlear implants provide significant benefits for congenitally or early profoundly deafened candidates who receive cochlear implants as adults. Recipients reported benefit from cochlear implants in the area of identity, hearing in the world and emotional wellbeing.

In another study of postlingually deaf adults Kobosko (2015) found that “higher CI satisfaction was associated with lower severity of depressive symptoms, whereas for the elderly, higher CI satisfaction was associated with less severe social dysfunction symptoms.” Wellbeing was increased and likely dependence on mental health services could be reduced and psychological support tailored to need.

Vieira (2015) provided further evidence that cochlear implants provided significant improvement in speech understanding in challenging situations, subjective perception of hearing performance, and quality of life.

Cochlear implantation also resulted in reduced tinnitus disturbance. Choi (2014) found that rates of long term use in older adults at more than 10 years of follow up exceed 80% – thus showing that early implantation of older adults once low levels of speech recognition are present are associated with greater use. They also concluded that “Clinical strategies and public policies promoting earlier rather than later cochlear implantation in older candidates are likely to lead to more favourable long-term outcomes and cost-effectiveness of cochlear implantation in older adults.” The effectiveness of bilateral fitting was further supported with Gifford (2015) finding that there were significant improvements in speech understanding when a second implant was provided, even for patients with high performing unilateral CI.



Cochlear implantation for older people

A number of studies have further supported our review of the benefit gained for older people. For example Hurate (2015) found benefit for over 60's, while Monsnier (2015) concluded from a large study of elderly people (65-85 years) that cochlear implantation *"restores aural communication, reduces their prevalence of tinnitus, improves the quality of life, reduces symptoms associated with depression and improves global cognitive function."* Further, *"predictive factors in this population provide a convincing argument to recommend treatment with cochlear implantation as early as possible in older patients with confirmed diagnosis of a severe-to-profound hearing loss and with only limited benefit from hearing aid use in one ear."*

This provides more support for our conclusion that elderly people with hearing loss should be routinely considered for implantation earlier than the current guidelines.

The dangers of not addressing hearing loss in older people had been further illustrated by Contrera (2015) who found that in a nationally representative sample of adults 70 years or older, moderate or more severe HI was significantly associated with a 54% increased risk of mortality.

Candidacy for cochlear implants

As we argued in our previous research the evidence also suggests we need to take a radical look at assumptions around the cost benefit criteria for cochlear implants and current candidacy and this should be part of a review of specialist commissioning in this area (Lamb 2013, Archbold 2014). Chandu (2014) has provided further support for this view in a review of candidacy for an implant in the UK noting that *"cochlear implant candidacy should be individually based and needs to take in to account work, quality of life, social impact rather than adhering to pure-tone audiometric guidelines. They should not be considered as strict criteria nor used to deny the benefit of a cochlear implant at the earliest opportunity."*

In the US, the American Cochlear Implant Alliance is working to ensure there is access to health care for children and adults who may benefit from cochlear implantation.

SUMMARY POINTS:

Cochlear implants have the capacity to make a profound difference to people's lives, ensuring people can continue to communicate and stay connected at work and socially.

Cochlear implants are cost effective on any current cost benefit measure but if the true costs of hearing loss were considered candidacy could be widened further on cost utility/effectiveness and quality of life grounds.

Cochlear implants also have a dramatic effect on the ability of the individual to retain economic productivity and therefore further reduce reliance on benefits and increase tax contributions.

Cochlear implants are beneficial across the age range in addressing not just the direct impact of hearing loss but also associated health issues such as dementia and mental health.

Candidacy for cochlear implantation should be reviewed, taking into account real-life measures of hearing benefit..

SECTION 4:

Potential savings to public services from addressing hearing loss

In our last report we looked at additional costs of not addressing hearing loss and found this amounted to an additional burden to society of over £30 billion a year with a significant proportion falling on public services either directly or indirectly (Archbold 2014). This added to work by Shield (2006) which estimated the additional costs to the UK economy of hearing loss at £13 billion a year and the National Longevity Centre (2014) which showed that underemployment of people with hearing loss has been estimated at £25bn per annum and could grow to £38.6bn by 2031.

The links between hearing loss and depression (which costs the NHS £520m a year (Harker 2011); falls (which cost the NHS at least £1.9bn a year); and dementia (which is estimated to cost £16,700-£37,500 per person affected) indicate that there is a significantly increased cost to the NHS of dealing with the ongoing effects of hearing loss resulting from links with these conditions. (Jopling 2015)

We now take these arguments further by looking at the period from 1992 and asking what the additional cost to the public purse would have been if new technology in the shape of cochlear implants and also massively improved hearing aids had not been available over this time. From this we also predict the potential savings to the public purse that would accrue if the technology was also more widely available.

The economic benefit of these technology developments

To understand the potential beneficial impact of introduction of new hearing technology, cochlear implants and digital hearing aids, combined with the associated societal changes, we have examined the level of savings to public services gained through their introduction.

This is a different process to usual economic evaluations of new technologies where an experimental environment is created so that the impact of the new technology on costs and outcomes can be isolated, measured and compared. Such cost benefit approaches are useful in ascertaining the effectiveness and cost effectiveness of new technologies, allowing for the latter to be compared with societal thresholds of willingness to pay and NICE and other bodies often use this methodology.

However, this fails to reflect the context in which the technologies are actually used. It may give rise to inaccurate assessments of a technology's relative value for money in practice. Further, the relationship between cost and outcome is often dependent upon the context in which a technology is used. It is not enough to have a cochlear implant to enable you to carry on working; you also need to ensure that you are not going to be discriminated against in the work place. Other methods must therefore be sought to try and assess the impact of new technologies over time.

Comparing the health care costs and outcomes among candidates for a new technology before and after its introduction can provide insights into the impact of its use under “real world” conditions. This might be done using long term follow-up of original trial participants. An alternative is to compare the costs and outcomes of potential candidates for a new technology before and after its introduction.

If deployed over a sufficient time period, this approach not only allows us to capture broader changes in context but also allows for potential changes in candidature for the new technology as health budgets, public expectations, and costs change.

We looked at the difference in the cost of services for those with hearing loss between 1992 and 2009.³ The services we examined were GP, inpatient, health visitor, home help, meals on wheels, social worker, chiropody, psychotherapy, speech therapy, physiotherapy, alternative medicine and “other” services.

Comparison of costs in the two time periods – expressed in the common years cost of 2014⁴ – provides an estimate of how much public expenditure under these headings would be required to support a person with hearing loss in 1992 compared to one from 2009 in today's (2014) prices.
(see Appendix 1)

³ These years were chosen as 1992 was selected as the base year for comparison as it was the second year of the British Household Panel Survey – allowing teething issues associated with the initiation of a survey to have been addressed and because it yielded a larger usable sample compared to 1991 the survey's first year of operation. 2009 was chosen as the last year, as it was the most recent year in which questions in the survey were asked in the same format as in previous years. A multivariate analysis was used to control for range of other factors that might impact on service use such as other health conditions, gender, age and education.

⁴ Based on the results of this where statistically significant differences in service use were detected these were monetised using 2014 unit costs published by the PSSRU. 2014 are the most recent unit costs available and are used to obviate the need to adjust for inflation over time, that is, to compare differences in service use in terms of a common “price”.

⁵ Using a definition of hearing impairment of 35db or more in the better ear, 3.8 million persons aged 18-80 (8.3% of the population) were estimated to have a hearing impairment and 7.5 million (17%) if a 25 db loss in the better ear is used to define hearing loss. The onset of self-reported hearing impairment appears to have been delayed somewhat overtime as the mean age of those reporting being hearing impaired in 1992 was 63.12 (95% CI: 61.8 – 64.44). While 17 years later the mean age was 67.10 (95% CI: 65.63-68.57). The mean age at which men reported hearing impairment in 1992 was 61.42 (95% CI: 59.69- 63.15) and of women 65.16 (95% CI: 63.14-67.18). In 2009 the mean age at which hearing impairment was reported was 65.62 for men (95% CI: 63.69 – 67.55) and 68.61 for women (95% CI: 66.42 – 70.81).

Savings already made – and those that could be made

We conclude that approximately £92 million has already been saved in reduced use of GP's and social work services when 1992 is compared to 2009 (the most recent year for which we have data). Over the time period we have looked at (1992-2009) this would represent an overall saving to the public purse of £1.56 billion. This is enough to fund expenditure on hearing services in the NHS for the next 3 years. One might almost say that cochlear implants are self-funding through a “revolving fund”, or cochlear implants for a much longer period.

Given the underutilization of digital hearing aids and cochlear implants this suggests that there is scope for massive future savings of up three times the current estimate here given here for those in need of hearing aids and up to a ratio of 20 times for cochlear implants given the underutilisation noted above. Further as our population stays alive longer we estimate that prevalence of hearing loss will increase by another 35% by 2030 meaning that simply taking a linear progression savings could increase by another 35%.

The Research

Looking at those with hearing loss over the period we examined we can see that in 1992 approximately 8.7% of the sample surveyed reported having impaired hearing; this compares with 10.1% in 2009. These figures are slightly less than recent estimates of the prevalence of hearing loss in Britain (Akeroyd MA et al, 2014).⁵ Akeroyd acknowledges the uncertainty around these estimates as well as the need to factor in those aged over 80 which would add approximately 2 million more persons to the estimate. The increase in the prevalence found in the survey mirrors that reported in the literature of roughly 12% - the estimate here being approximately 15%. Between 1992 and 2009 the average age among those reporting hearing loss rose by approximately four years; slightly longer for men and slightly less for women.

Costs

Relative to those without hearing impairment, those in 1992 were 1.7 times more likely to use GP services in 1992 than in 2009. They were also six times more likely to use social worker services relative to those with hearing impairment in 2009.

Reference costs for GP consultations in the UK are based on consultations of two lengths, 11.7 minutes and 17.2. The additional cost per person per year associated with hearing loss related to GP service in 1992 was £12.47 compared to £7.44 in 2009, a difference of £5.03 based on an 11.7 minute consultation. The comparable figures, assuming a 17.2 minute consultation were £18.16 in 1992 and £10.84 in 2009, a difference of £7.32 per person per year.

Looking at the use of services in the different years we see the following which shows a dramatic reduction in the use of services and therefore costs to the health service over time.

If we assume the number of persons with a hearing loss in 2009 was approximately 10 millions (7.5 million with a hearing loss of 25db in the better ear aged under 80 and approximately 2.5 million aged over 80) and in 1992 approximately 12% less than this, this translates to a prevalence in 1992 of 8.8 millions. Multiplying this by the combined additional GP (£5.03 and social worker cost (£1.05), £6.08, this translates to an annual additional cost of £53.5 millions, based on 11.7 minute GP consultations and 1 social worker consultation. Assuming 17.2 minute consultations and 3 social worker visits per year the comparable figure is £92.14 million per annum.

Service	Duration of consultation/ frequency of contact	Additional cost* per person per year (£) 1992	Additional cost* per person per year (£) 2009	Difference in cost (£) of hearing impairment per person per year (1992 v 2009)
GP	11.7 minutes	12.47	7.44	5.03
GP	17.2 minutes	18.16	10.84	7.32
Social Worker	3 visits per year	3.15	0	3.15
Social Worker	1 visit per year	1.05	0	1.05

*compared to non-hearing impaired



Discussion

Those who reported hearing impairment in 1992 were more likely to make use of GP and social worker services than were those in 2009, controlling for a range of other variables and would cause additional costs as a result for health and social services. It is perhaps dangerous to speculate too forcefully in relation to other elements of service that approached statistical significance. It is nevertheless the case that both psychotherapy services and inpatient services were significant at the 90% level and are consistent with the direction of cost.

Culmulative impact of new technology over time

Our calculations over the period 1992 to 2009 estimate that the prevalence of hearing loss increased by around 35% over time due to greater longevity and population 'bulge' associated with the baby boom generation.

The savings we estimate to have occurred between 1992 and 2009 are £92 million per annum. This was the period during which the introduction of both digital aids and cochlear implants took place for this population and began their impact on health and quality of life. If more people who were eligible had taken up the technology during this period it seems reasonable to assume that these savings would have been greater. A simple linear extension would suggest that if we triple those who benefited from the technology we would have generated further savings perhaps of a similar order of magnitude, i.e. by 3.

Projecting forward to 2030 shows a further increase in the prevalence of hearing loss by approximately 35%, based on population aging alone. Extending the argument above this would indicate the potential for still further savings if access to new technologies increased by a similar order of magnitude: by a further 35%. If we then factor in changes of behaviour or availability of the technology the savings could be much greater still. For example if hearing aids and cochlear implants were used by all who could benefit this would provide a further three fold benefit for hearing aids and twenty fold benefit for cochlear implants comparing current usage with optimum usage as measured by everyone who met current clinical criteria receiving a hearing instrument. This is obviously a large assumption under current levels of utilisation. Further the fact that access to hearing aids is currently about to be restricted for the first time since 1948, when the NHS was established, the main point is simply to illustrate that the greater the utilisation of hearing aids and cochlear implants the greater the potential savings elsewhere in the health and social care system.

SUMMARY POINTS:

We have shown that those with hearing loss before the emergence and uptake of new technologies would have resulted in additional expenditure of **£92 million** pounds a year compared to those when access to such technologies existed. This represents real savings in terms of demand on GP and social care services that would otherwise have arisen.

Savings will in reality be much higher than this as we did not consider the effect on quality of life, economic wellbeing or on costs to other relevant services beyond those funded publicly.

This suggests that the benefits from the introduction of cochlear implants and other new hearing technology could materially outweigh the additional costs on the NHS of funding these services if we account for the wider benefits.

SECTION 5:

New personal perspectives: What do adults tell us about the benefits from implantation, and the implications for society?

Athalye (2014) explored the experience of those who had been refused a cochlear implant and the negative effective this had on their lives. As part of the research for this publication, we further examined adults' perception of the benefits cochlear implantation had produced, especially in relation to some of our key factors which would make people more dependent on public services or would reduce their income, independence and general wellbeing.

Ng of The Ear Foundation, carried out an on-line survey of adults with implants, which produced 149 responses. Respondents were overwhelmingly positive about the impact of their implant on increasing their independence and wellbeing.

Specifically they:

- were able to communicate more independently;
- relied less on communication support;
- functioned better on the telephone;
- had more confidence in the workplace, and with family and friends;
- were able to take up more sports activities.

Typical comments on the impact of cochlear implantation included:

"Before implantation I always lived in hope and coped as much as possible with same awful hearing loss in both ears that didn't respond to hearing aids. Also had dreadful tinnitus. But still worked and carried [on] as normal as possible. Life since my implantation which was only just over 4 months ago is full of hope, full of sound and full of positivity."

"Before the cochlear implant I was semi-reclusive and embarrassed to be in company but tried to carry on in the best way I could. I did in fact work part-time in a small office until I was 60 as I was quite determined to do that. My boss was very considerate and answered the phone himself. Since the implant my life has been improved totally."

Impact on social isolation

Respondents revealed a huge increase in confidence after implantation. They were asked about how confident they were at home, work, socially or during sport activities: very, a little or not at all confident:

Question: How confident?	Response options	Before implantation	After implantation
At home			
	Very	43%	94%
	A little	45%	6%
	Not at all	13%	0%
At work			
	Very	17%	75%
	A little	52%	25%
	Not at all	30%	0%
Socially			
	Very	9%	56%
	A little	38%	41%
	Not at all	5%	3%
During sports activities			
	Very	15%	58%
	A little	43%	29%
	Not at all	42%	3%

The stigma and the social isolation that follows from being deaf were referred to by a number of people.

One described:

"Being deafened as an adult is akin to suddenly becoming the village idiot.... the CI has delivered me from that and I am very thankful."

They also spoke about the social isolation:

"I was still trying to socialise, I'm an outgoing type, but often went home from the pub in tears. I was able to manage as my father's carer, but couldn't manage in an office."

Before implantation:

"No social life. Feelings of isolation. Frustration. Unable to mix even with family. Unable to watch television without missing most of the dialogue...."

Effects on employment

As we noted earlier the effect of not being able to maintain employment is a significant loss to the family and also creates additional cost to the benefits system.

This was fully reflected in the open responses:

"Much less dependent on communication support, after implantation. Only for large work meetings. No communication support and could not even get a response from job applications. 3 years unemployed until implanted. First job application after implant that I did not have to declare deafness I interviewed for and got the job and recently doubled my initially part time hours; So from meagre benefits to full time employment - PRICELESS!"

Interestingly this respondent illustrates the more general point in that underreporting of hearing loss means we do not have the full picture of the potential benefits which might accrue from greater provision of technology.

Another respondent found that it allowed them to continue their career:

"At one stage before my implant it was suggested by a colleague that I go back to retrain as a special needs teacher. As I have spent all my life in the hearing world if I had not had the implant it would have meant continual isolation which I did not want. Parents of school pupils had no objection to me supervising their children on trips abroad, which included going to California and Australia, so it gives you a confidence boost to be entrusted with young pupils."

Another found that:

"The CI has allowed me to continue working which was very much in doubt before implantation"



Others have been able to do their jobs more effectively:

"still a part-time library assistant, but I can hear what customers and colleagues say without always looking at their faces. I can follow group conversations a lot better, from wherever I am sitting"

"I had cut down on my teaching before the implant, not taking on new pupils at all. Now I feel confident to take on more pupils on a one to one basis."

"I have achieved more in my employment and find it immensely rewarding. I have become active in a number of charitable organisations relating to CI's and hearing loss which I would never have done."

Or obtain employment and develop their career:

"Having grown up as a hearing person then lost my hearing completely, the CI was a miracle for me and has given me the best opportunity to achieve my potential without natural hearing. For many years I did not work and believed I was unemployable. I was then given an opportunity to work in a charity which I now lead. I have a very fulfilling job and employ 23 other people - none of this would be possible without my CI."

While others spoke of the economic impact of losing their job because of communication issues which had led to mental health problems:

"I was employed as a transport manager. But when I reached the age of 58 my employer for 28 years with the same firm found a way of disposing of my services. He commented that he was worried about my communication with customers, and I eventually had a breakdown which meant that I was not able to work for six months. Then when I told the boss that I was able to return to work he said that he no longer needed my services."

And where better access to implants might have saved their jobs:

"I had to resign as I no longer could run daily meetings; I no longer could produce Minutes of Meetings... I applied for a Cochlear Implant... that took still a number of years. The xxx hospital in London refused for many years. I eventually went to Holland and got the cochlear implant operation there successfully."

"I had to leave a full time job (cashier) as my hearing got worse. I was very upset and found little or no help in those days. It was very difficult to cope and a bit of lip reading helped before my first implant. I tried not to be in a group of people and it took the family a long time to realise how difficult [it] was for me."

"My hearing loss caused a loss of confidence that lead to my early retirement from education as Dean of a University"

"I lost my hearing suddenly and completely at the age of 24. I had a new baby so was on maternity leave. It was life changing. I lost all my confidence and was afraid of being left alone. I was unable to return to my job - as a solicitor."

"I was forced into early retirement because of my hearing impairment."

"I was CEO of a charity but it was many, many years before I returned to paid employment and believed I was unemployable."

While this did not always save people's jobs it did allow them to also move on to other jobs:

"Despite showing a complete change members of my profession still would not accept me being deaf and at one time tried to prove that I was unsafe in my job. ...it was then suggested to me that I do not go into the classroom because of my deafness and claim early retirement on ill health. The school would support my application--I duly received my enhanced pension. This did not prevent me taking up a post in another school as a hockey coach---a much better situation than before!!!!!"

Impact on independence

Question:	Response options	Before implantation	After implantation
Dependency on others for communication	A lot	67%	8%
	A little	25%	58%

There was a reported dramatic reduction in the dependency on others for communication before and after implantation. Increasing independence and reducing isolation is crucial to reducing morbidity and therefore additional calls on services. The positive impact of having a cochlear implant was illustrated throughout the responses.

Many described how impossible their life before cochlear implants had become:

"My world was just getting smaller and smaller as my hearing deteriorated. I was no longer able to cope with going out to the pub or for a meal with friends because invariably the environment was noisy and my hearing aids struggled with background sound. I twice nearly got run over crossing the road when I had thought it was clear to cross having not heard a fast motorbike coming. I struggled at work with meetings and phone work and relied on my colleagues for help to do my job. My children grew up alerting me to the door and phone ringing and often came to Dr and other appts just in case I 'missed' something. By the time I approached the hospital for an implant I was really quite depressed."

Increased use of the telephone was linked to increased independence:

Question:	Response options	Before implantation	After implantation
Telephone use	A lot	7%	28%
	A little	38%	49%
	Not at all	56%	23%

There was a clear perception from many participants that increased independence had resulted from increased awareness of environmental sounds and the confidence this can give:

"I am also able to pick up more environmental sounds and this is a bonus for me because I have some restricted peripheral vision. I can hear emergency sirens and alert my husband!"

Being bilaterally implanted means I can pick up directions of sounds - an excellent facility to support my being able to move around safely."

After the implant people spoke about the profound positive effect on their lives:

"I applied for an implant and it was exceptionally successful and has given me hearing that has never been so good since my childhood."

"My life has changed completely. I am completely independent and have full confidence to do the same things as normal hearing individuals."

"I trained in my last job to be a trainer of staff in safe Manual Handling Practice - something I could never have imagined being able to do prior to my implant!"

Another commented that:

"After having children I had been unable to resume my job as a secondary school teacher because of my hearing loss. I struggled to find any other worthwhile activity that I could cope with hearing-wise. This all resulted in great loss of confidence, as well as financial strain. At home I felt more and more isolated from my family and their activities, being unable to manage conversations unless one-to-one... It was just a case of battling on a day-to-day basis and trying not to get distressed."

The feeling of being much more independent and the positive impact this has on their wellbeing was often commented on:

"I am a much more independent, confident and happier person now, (despite) going through divorce. I now feel in control of my life. I feel whole. Going on holiday and being able to hear the many different things that I have missed, eg the sea, the small insects e.g., cicada, the guides etc. being able to talk and socialise with new people, it's just so amazing. Being able to hear music is awesome, old and new."

We know that it is the ability to carry on communicating which brings about the sustained benefits in terms of increased wellbeing and independence and respondents were clear that the implant has saved on communication support:

"Since the implantation of both ears I no longer require communication support."

While some also felt that they would benefit from having a second implant:

"Despite only having one (would love the second one), my life has changed totally. Less stressed more confident and happier. Less isolated. Future feels very positive and I am learning hearing all over again - feeling like me again before my hearing loss so amazed by the change. Best thing that has happened to me for years."

Impact on family life

The impact on home life and therefore wellbeing of the whole family has been profound for many respondents; *"my husband does not feel I am so reliant on him to interpret. I am more social with the family. I can communicate with my children, and their friends. My twin sister feels like she has got "me" back, as she felt she was losing me before my implant as she lives away and communications were difficult."*

"My husband and sons were amazing in their support and patience but as it became increasingly difficult to communicate with me it must have been very exhausting! They now say it's like having me back from 10 years ago."

It has also meant families have been able to reconnect and address loneliness:

"I now spend Christmas with daughter - previously I preferred Christmas at home alone as it was so difficult to communicate with a crowd."

Informal Carers

Being able to take up or continue informal caring responsibly with partners was also identified as a significant benefit of obtaining the implant:

"My wife was diagnosed with Alzheimer's Dementia about the same time as implantation and she relies on me 100 per cent. I have to meet with medical staff to discuss her situation, something [that] would [otherwise] be impossible now, as hearing loss would have continued to increase and by now would be almost zero, even with the most powerful of hearing aids."

This aspect of independence is often not acknowledged or taken into account when looking at the benefits of cochlear implantation in older age. As another respondent noted:

"At the time of switch on my husband who had Parkinson's became unable to cope so I was able to take over the day to day things in life and became his carer."

Given what we know about morbidity in older people with hearing loss it is important to recognise that if one partner cannot cope any longer because of communication issues it will often mean the other cannot be cared for effectively. This could hasten greater dependence on expensive care solutions that would not otherwise have been necessary.

Placing an economic value on cochlear implantation

We also looked the economic value respondents would attach to their implant hypothetically. While in research terms this is a useful way of trying to value the worth of the intervention to the patient it caused some concern to the participants in our study. They found the whole concept of a cash value troubling as it was *"Difficult to put a price on something like this! I have never thought of it in cash terms."* Others felt that it was *"Impossible to put a figure on its worth."* *"It has given me my life back. How to value that?"* Also that *"It's actually worth a million pounds to me. I only have a pension so to receive this on the NHS is a miracle to me."*

There was also a fear that the question might be prelude to charging. One respondent commented that:

"I do not like this question, because it is implying that a price can be put on something that is so life changing; you might as well ask what is a child worth to you in financial terms. A cochlear implant should not be reserved just to someone who can afford it. It is something that should be freely available to everyone who needs one, whatever their capacity to pay. It should be the same for a man or woman on benefits as it should be for a millionaire. Decent hearing (as is decent vision and health) is a benefit that should be universally available to all for nothing."

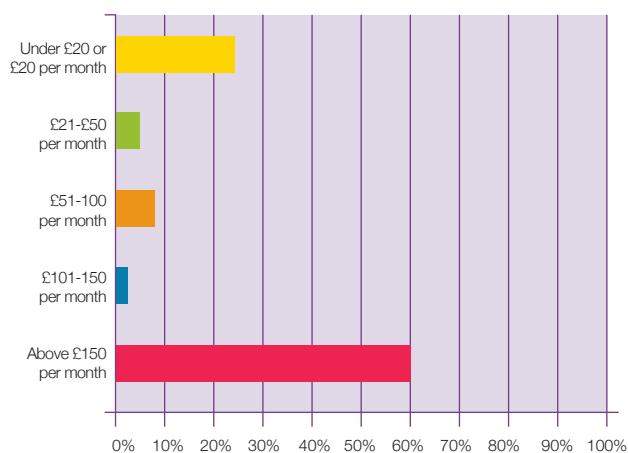
Another commented that:

"It is beyond financial value so I have put the highest amount but this would not be something I could afford!"

Some participants had paid for the Implant privately *"Since we paid for it because I was 35th on the waiting list it's worth is immeasurable."* While others who had paid privately wished that they had the money to have a second implant *"I cannot afford personally to have another CI operation but my present Speech processor means a lot to me....cannot put any value to it."* While another noted that cost was a major issue to obtaining another implant *"I would love a second implant, but it is too expensive to buy one privately."* Another respondent spent their inheritance to secure an implant; *"I spent £33,000 to pay for my CI, I used the entire inheritance to have it in Jan 2001. Each and every penny has been worth it, I am money poor but life rich."*

Despite the fact that many participants had concerns about ranking financial value of those that answered 60 % chose the maximum value of £150.00 per month as the amount this was worth. Other work looking at the patient perspective on the value of CI's (Buhagair 2012) found that when asked whether they would rather have £15,000 or a second implant, all except one said they would rather have the second cochlear implant.

In financial terms, what is your implant worth to you?



Thoughts on eligibility

Some participants raised the issue of the way testing was done to establish eligibility.

One commented:

"Appointments before my implant were terribly traumatic, hundreds of tests that were constantly repeated, and no indication that I was going to get an implant. I felt as if I had to jump through hundreds of hoops to prove how deaf I was, how bad my life was, and had to wait over an hour to see the Consultant at the end of a Clinic, I was interviewed in front of about 6 health professionals, which made me feel a criminal. My Audiologist kept telling me that I had to prove I was profoundly deaf in order to get an implant, because lots of people exaggerated in order to get one!!"

We need to ensure that people can have their health needs addressed without feeling like this.

SUMMARY POINTS:

Patients fitted with cochlear implants describe profound changes to their lives, including greater ability to communicate, less reliance on others for communication support, gaining and retaining employment, the ability to continue to care for others and increased independence for themselves.

Patients report increased wellbeing and a reduction in stress, anxiety and reduced isolation which also leads to less reliance on health and social care services.

Patients put a very high economic value on the benefit of their cochlear implant but most would not be able to afford this privately and value the fact it is available on the NHS.

Patients feel that the time they had to wait to gain a cochlear implant and the lengths the way the assessments were carried out to show they would benefit are sometimes unreasonable.

SECTION 6:

Bending the spend: Innovation in Service Delivery

Hearing loss is a long-term condition, requiring long-term management. Where hearing aids or implants are fitted, they require a life-time's care and maintenance in order to provide benefit to the adult with hearing loss, and the potential cost savings to society that we have described.

In the case of hearing aids, provided in audiology clinics, there is evidence that adults, particularly older adults, have difficulty in adjusting to their hearing aids. There is considerable anecdotal and research based evidence that many people with hearing loss who have a hearing aid do not use it at all or use it only sporadically, with a consequent effect on cost-benefits. Action on Hearing Loss NI highlighted this in their evaluation report for the Big Lottery (September 2012) as follows:

"People with hearing loss often fail to avail of mainstream service provision due to a lack of knowledge/awareness. Many of those that do avail of mainstream services fail to get the best from their hearing aid (or use it at all) due to a lack of available resources."

"If you are having problems getting used to your hearing aids, it is sometimes easy to give up and put them in the nearest drawer."

AoHOL, 2009 (Out of the drawer).

There are a number of initiatives to reduce the numbers of "hearing aids in the drawer": for example, DVDs to support progress (Ferguson and Henshaw, 2014), the work of HearingLINK with their Intensive Rehabilitation Programmes (www.hearinglink.org) and services such as Hear to Help, developed by Action on Hearing Loss, where support for hearing technology is provided in the community, in care homes, sheltered accommodation and community centres.

Of those using the service run by The Ear Foundation in the community, 96% report it being very helpful:

- It's such a valuable service as it encourages elderly people to get their aids checked regularly and empowers them to know that they now have the confidence to use their hearing aids effectively. (Care centre manager)

The service was great, easy to talk to various people not in a hospital environment' (User of service)

- I now know how to help Mr P change his batteries- and that it's important! (Carer)

An independent Social Return on Investment report of the Hear to Help service for Action on Hearing Loss found increased hearing aid usage in those who attended, increased confidence with the technology, increased confidence, sociability and ability to participate more fully (AoHL, 2014). Overall it appeared that for every pound invested in the Hear to Help project there was a social value created of £10.34, taking into account the benefits in quality of life and well-being.

In the case of cochlear implantation, services are often delivered in specialist centres, and long-term management remains there. For cochlear implant centres, there are challenges in providing long-term care, with increasing expense as the numbers in the long-term grow. Business models have been suggested on the lines of "lean" practices advocated in the car industry (Backous) in order to produce more cost-effective models of long-term service delivery. Different models of service delivery have been discussed and recommended for some time, promoting the delivery of long-term care in the community, rather than in specialist centres.

For example see Archbold and O'Donoghue (1997).

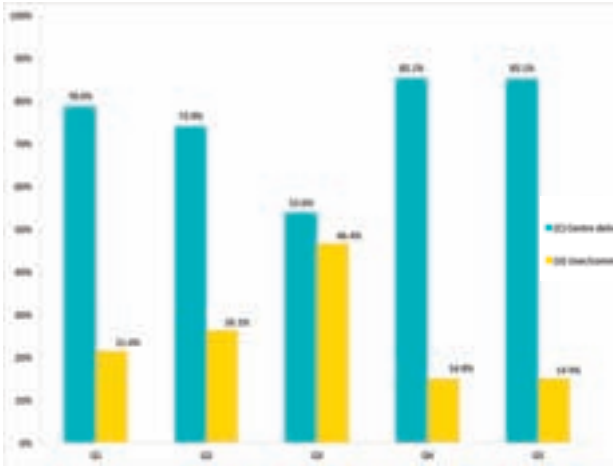
A study by Athalye et al (2015) surveyed users of implants, parents, and professionals about the challenges of cochlear implant service delivery, and what they would like in the future. They found that restrictions on the number of candidates being funded was the major barrier (51%) as well as restrictions on funding (44%), followed by a perception that the overall service was governed by political issues in funding (44%).

Users were also asked how their cochlear implant services were being delivered currently. They were asked five questions about services, as shown in the table below.

Q1	Was generic care and maintenance of their implant system delivered in a cochlear implant centre (C), or more locally as part of a user community (U)?
Q2	Was the need for any additional technology assessed by a cochlear implant centre (C), or more locally as part of a user community (U)?
Q3	Who decides the best approach to treatment? Is it a cochlear implant centre (C), or the user/as part of a user community (U)?
Q4	Who decides on programming options? Is it a cochlear implant centre (C), or the user/as part of a user community (U)?
Q5	Was generic care and maintenance of their implant system delivered in a cochlear implant centre (C), or more locally as part of a user community (U)?

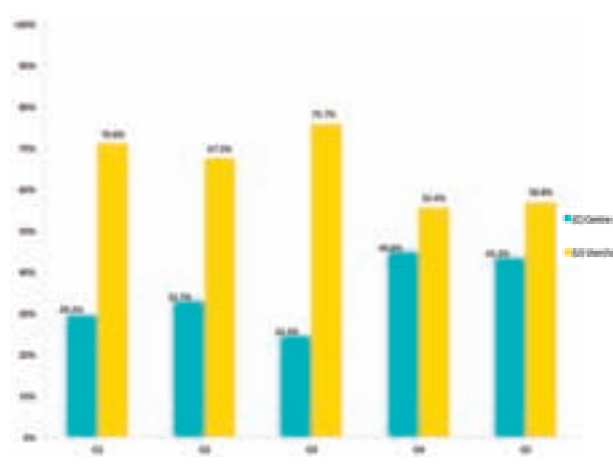
As shown in the figure below, the overriding response by all groups of respondents to the five areas asked was that services were currently delivered in a centre based model (the blue bars) as compared with community based models (yellow bars):

Views of current service delivery (n=530)



When asked how they would like to see the same five services delivered in five years' time, there was a significant shift to a desire for more community-based services (yellow bars), as shown in the figure below:

Views of future service delivery (n=530)



There was strong agreement that cochlear implant services should be delivered in the community, involving local professionals, and using the latest technology to link to specialist cochlear implant centre. For example:

- *“For long term CI users – a technical service that can be delivered via the internet/remotely so that the team can spend the time more effectively on managing newly implanted patients in the early stages.”*
- *“Rather than ring the CI centre for spares for the processor an email tick chart for requests or mobile phone text messaging where people can leave details of the spare part they require.”*
- *“Remote programming of patients, at home or in local audiology services using telemedicine. Scientists and surgery still provided by the specialist centre.”*

Typical responses from CI users include:

“CI services are becoming more detached from Audiology services and many of the clinicians in the CI services appear out of touch with the demands placed on Audiology.”

Respondents were spontaneously aware of the challenges brought about by funding pressures on health care: *“I’m very happy with my service currently, but am concerned about imminent change resulting from limited resources.”* (Athalye et al 2015) The research concluded that:

- Work needs to be done to integrate cochlear implant services into community and audiology services. This would be a step towards improving their access and long term sustainability as well as cost effectiveness
- Implant centres need to focus on delivering services that are jointly led by decisions made by user/carer and CI team as opposed to the CI team solely
- The perceived challenges of funding restrictions and political decisions need to be considered while planning the long term sustainability of the services.

Overall participants want implant services to be integrated into audiology and other community services when it comes to provision of appointments, accessories, treatment and long term management.

The advantages of doing this would be increased patient choice, a reduction in travel time and more effective community support and aftercare which should reduce costs. These services are currently provided at specialist tertiary centres which may be several hours away from the patient’s home necessitating travelling expense, time off work and family disruption. Making this care pathway patient-centred will provide a more efficient service and allow more timely identification of issues and help Bend the Spend towards more effective provision.

Some innovative services

There is a growing interest internationally in the power of tele-health to deliver improved health-care services to more people, more effectively. The technology of today, providing the ability to connect via Skype and Facetime for example, means that delivering services closer to home and in the community is becoming a realistic proposition. Putting users of technology in touch remotely with those who can support them becomes possible; and users of all health-care systems are demanding greater ownership of their provision.

For example, more innovative ways of looking at long-term management of cochlear implants include taking device maintenance and spares out of the expensive intensive clinic-based service and delivering it through the manufacturers. One example is Cochlear Care, where the specialist implant centre is no longer responsible for the provision and maintenance of processors, and the user of the system is in direct contact with the manufacturer for this support, freeing up the cochlear implant centre to focus on the clinical user issues, a more efficient use of their expertise.

Developments in technology make the possibility of remote programming and maintenance of implant devices increasingly possible (Ramos et al, 2008; Rodriguez et al, 2010) with high levels of satisfaction. Changing technology makes such developments increasingly easy and a growing reality in many places, such as Australia.

Tele-health practice in Australia

In Australia, where long distance services are routine, cochlear implantation management is now delivered on line, rather than in the specialist clinic – with ongoing programming (mapping) of implant systems being done through a Skype connection. (Psarros, 2015).



Over the past 30 years, there has been an exponential growth in adults receiving a cochlear implant in the service in Sydney meaning that existing models of aftercare and support were being challenged. In addition, a third of all CI users who use the service are now aged over 60. With the increase in the ageing population CI professionals have developed models of service delivery tailored to the needs of their adult patients, in particular the elderly. This group needs easy geographical access, mobility access, support from their family and community, and an awareness of the possible growth of cognitive decline with ageing. Over 30% of the users of the Sydney services live over one hour from their local cochlear implant centre. To address the geographical access for clients, services are provided using outreach clinics and more recently telepractice.

Outreach clinics are held in regional centres 3 to 4 times per year with teams of cochlear implant professionals travelling to provide comprehensive cochlear implant review and monitoring, or evaluation for cochlear implant suitability. These clinics involve linking in with local professionals to ensure interim monitoring and support can be provided at a local level.

Telepractice through the use of Skype or other forms of videoconferencing has also been used with adults and elderly clients. They have found that age is not a barrier to the use of such technology, and this platform of service delivery has enabled the monitoring of progress, troubleshooting and auditory training for clients where mobility and geographical access has been an issue.

Another change made possible with this changed service delivery model has been to involve speech and language pathologists (therapists) in the long-term care, rather than only the audiologist as in the past. This ensures support not only with technological changes, but also with the communication changes which need support. Moreover this support is delivered in the community, with patients' families and carers. Psarros and colleagues (2015) report that this approach has allowed more effective continued use of Implants in the elderly population without the need for expensive and difficult clinic-based follow up. This has ensured optimum benefit for the individual and potential savings on aftercare, providing greater efficiency by reducing cost and ensuring optimal use of the device.

It also ensures that adults are fully involved in their own development – which we know is essential for compliance with advice (Clark & English, 2014).

Developments in the UK

There are other examples of tele-practice and in the UK; Cullington (2015) is working on a project to design, implement and evaluate a person-centred long-term follow-up pathway for cochlear implant users offering a triple approach of remote and self-monitoring, self-adjustment of devices and a personalised online or smartphone intervention package for testing their own hearing at home. This is delivered alongside information and self-rehabilitation.

Potential benefits for the patient are:

- more stable hearing (problems identified and resolved quicker)
- convenience of not travelling to routine appointments
- reduction of travel cost and time, time off work and disruption to family life
- increased confidence to manage own hearing.

It should also mean that the clinic has greater resources (time, money, space) to see complex cases and the population of new patients coming forward for implantation.

SUMMARY POINTS:

Effective use of telecare can ensure better utilization of hearing instruments and enhance patient confidence in managing their own hearing leading to savings for the clinic and the opportunity to extend the service.

What all these case studies have in common is that they show we need to think differently about how provision is organised and delivered to ensure that whatever resources are available they effectively deployed to get the best possible benefit. Financial challenge can lead to service innovation as the recent report from Action on Hearing Loss (2014) showed in respect of current health service restrictions. However we need a more strategic approach which looks across the whole system and investigates how we can Bend the Spend to ensure a more dramatic and long term extension of the benefits which the new technology offers.

Commissioning and provision needs to be more integrated at the community level to ensure more appropriate services are delivered more cost effectively.

Innovation in service delivery shows that it possible to make use of the latest telemedicine techniques to improve access to services and quality of service to ensure maximum long-term impact of new technologies.

Specialist commissioning needs to be reviewed and to take account of the latest innovations in technology, cost provision.

SECTION 7:

Barriers to accessing the technology

There have been a number of barriers to the adoption of new technology within the NHS. In relation to cochlear implants there is clear evidence that greater knowledge and understanding of the benefits of cochlear implantation among medical professionals would be helpful.

In a recent survey the British Academy of Audiology (2015) found that in audiology services less than 50% of professionals felt that they were very confident of the criteria for referring patients for cochlear implants. This is not surprising, as 47% had not had training on cochlear implants within their service. Over half had not had any update within the last year and 27% had not had any information within the last 3 years, while over 60% said they would value more training.

This concurs with research from Strachan (2014) who found that practitioners were unconfident about the national criteria around commissioning. 136 ENT specialists responded to the questionnaire and 53 audiologists. 50% of the ENT consultants had a special interest in otology.

On being shown a two audiograms which illustrated hearing losses suitable for CI referral only 29% and 55% of ENT specialists and 24% and 67% of audiologists would have referred these patients respectively. However this improved following training.

Results from the clinical scenarios also demonstrated a lack of awareness regarding appropriateness of referral in specific situations. Surprisingly, only half of ENTUK members and a third of audiologists would have referred a deafened adult with other significant health problems. Around half of respondents did not refer deafened adults with learning difficulties when it was appropriate to do so. 35% of respondents would have erroneously not referred deaf adults who use British Sign Language and speech.

A third of ENTUK members and more than half of audiologists would not have referred deafened adults over 75 even though age is not a restricting factor.

This lack of up-to-date information appears a barrier to access to cochlear implantation for adults. For example a training programme delivered to 13 audiology centres covering 153 audiologists also found that knowledge of modern cochlear implant practices was poor in the audiology departments. Audiologists were not confident of referral guidelines or how to counsel patients on the benefits of cochlear implants. Less than half had referred a patient for cochlear implant assessment, yet following the training there were 4 referrals from an audiology department previously not referring. In addition, 3 potential candidates were referred after speaking to an existing cochlear implant user and an increased referral rate was seen by cochlear implant centres from the departments which had received the training. Many audiologists were also unaware they can refer direct to an implant centre. The trainers also felt those being assessed would benefit from peer support from someone who had been fitted with an implant. (Cochlear 2015)

The research suggests that a lack of knowledge of CI referral criteria amongst ENT doctors and audiologists may be a contributing factor for lack of referrals for CI assessment. Also it suggests that further education on the referral criteria in a cochlear implant assessment may increase the number of referrals for implantation assessment which our research suggests would be beneficial.



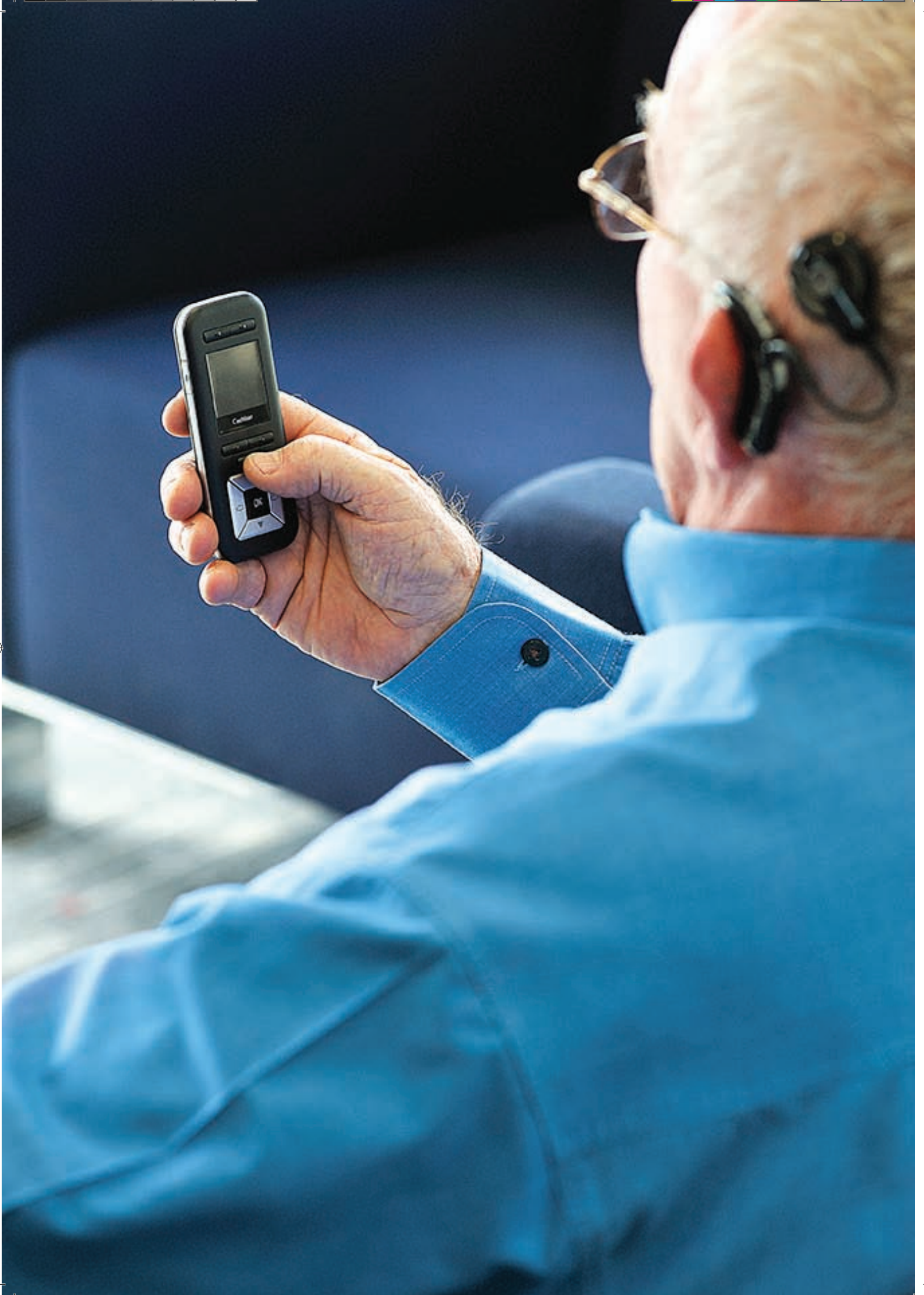
SUMMARY POINTS:

More training needs to be put in place to ensure that audiology and ENT professionals are fully aware of the latest developments in cochlear implantation and by extension other developments in technology around profound hearing loss.

Further information and training is need to ensure that audiology and ENT professionals are aware of the current criteria for referral and can be confident in applying this to ensure that those who meet current candidacy can be properly assessed.

Greater awareness amongst professionals leads to more hearing loss being addressed and more long term savings.





SECTION 8:

Conclusion

The development of the Action Plan on Hearing Loss provides a platform for action in England and could provide a model for other health services. We need to ensure that decision making on commissioning and funding, eligibility for treatment and continuing support is driven by a better understanding of the costs of not taking action. Only then can we start to Bend the Spend towards a health system which can meet the public health challenge of growing hearing loss. If we can do this then the aspirations of the Action Plan can become a reality in England, and serve as a model elsewhere.

To ensure that we can take advantage of the opportunities afforded by the new technology to address hearing loss and save public services money we recommend that:

- 1 As part of the implementation of the Action Plan on Hearing Loss, NHS England should ensure there is a review of the current specialist commissioning criteria for cochlear implants working in collaboration under the principles of co-production with the users.
- 2 In line with the aspirations of the Action Plan on Hearing Loss (England) commissioners of health care should look at more innovative models of funding and service delivery including opportunities created by telemedicine, service innovation and new delivery models.
- 3 The National Institute of Clinical Excellence should review its current guidance on cochlear implants for both unilateral and bilateral implantation to take account of real world benefits and additional costs of hearing loss.
- 4 The National Health Service (NHS), working with the audiology, medical professions and users should develop a targeted programme to promote greater awareness of the benefits of cochlear implants for GPs and other health professionals including the importance of early intervention and integrated planned support as part of the Action Plan in England.
- 5 Professionals in Audiology and related services have the training and support to ensure that they can properly identify and refer those who could benefit from cochlear implantation.
- 6 Health care providers should ensure that those with hearing loss have their needs assessed and are supported to effectively self-manage any other long term conditions they may have.

"My social life has improved greatly as I can hear the music really well and am able to socialise much more confidently. I can manage better in noisy situations and no longer feel anxious when dealing with situations that involve communicating either by phone and so join in conversations when traveling. I go to the theatre and cinema now. I had stopped going before. I feel safer in my house and when traveling as I can now hear. I am more confident at work. I can make appointments independently. I am not depressed and withdrawn."

A cochlear implant user.

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Appendix

Assumptions behind the Research

Having estimated the additional cost associated with hearing impairment in 1992, we repeat the exercise in 2009. As noted already the approach differs to that of previous analyses in terms of the sample weights used and in terms of the function used – that is the specification of “other” conditions to include cancer and stroke, necessary to ensure the model specification is consistent over time. Additional service use is monetised using the 2014 PSSRU unit costs data, to ensure a common pricing over the two time periods. With respect to GP services this was based on consultations assumed to last 11.7 and 17.2 minutes in duration including direct care staff costs and qualification costs (PSSRU page 195). For social workers, the figure used related to those working with adults and are expressed on the basis of per hour of client-related work (PSSRU page 207).

In this study we estimate the cost of hearing impairment when the technology did not exist and when it did. We take the equation when the technology did exist and when the technology did not and examine the difference between the two related to hearing impairment to ascertain what the impact of the new technology – and all other changes – has been.

Ongoing uncertainty around the prevalence of hearing loss in the UK and at what level hearing loss might trigger a person reporting him/herself as hearing impaired will impact on the estimates produced. The figures used here are based on current estimates and while the percentages in the survey differ slightly from those published elsewhere they remain broadly consistent suggesting that the survey sample of hearing impaired are broadly comparable with those meeting criteria for hearing impairment in the literature.

“It’s actually worth a million pounds to me. I only have a pension so to receive this on the NHS is a miracle to me.”

A cochlear implant user.

To achieve the aims outlined in our reports The Ear Foundation is leading the Adult Cochlear Implant Action Group which has been set up to promote greater access to cochlear implants and more awareness amongst the medical and audiological professions of their benefits. The group includes all the key professional and user associations.

If you want more details about the campaign contact Sue Archbold or Brian Lamb c/o Marjorie Sherman House, 83 Sherwin Road, Nottingham NG7 2FB. Telephone 0115 942 1985 or 07779 146022.



*“Decent hearing (as is decent vision and health)
is a benefit that should be universally available
to all for nothing.”*

A cochlear implant user.





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